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(54) IMPROVEMENTS IN OR RELATING TO  
 FORCEPS INSTRUMENTS

(71) We, RICHARD WOLF GmbH, a German Body Corporate, of Pforzheimer Strasse 22, D-7134-Knittlingen, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to forceps instruments for fitting tantalum clips for sealing off the Fallopian tubes in the human female, the instrument comprising a barrel with an operating handle at its proximal end to close and open forceps for the clips at the distal end of the barrel while observation takes place by means of an optical system.

To seal off the Fallopian tubes for contraceptive purposes, clips made of tantalum are fitted, using a special forceps instrument, while observation takes place visually. Two forceps units are used for this, namely the forceps proper for fitting the clips (hereinafter referred to as the clip forceps), and a smaller pair of forceps or movable hook to allow the Fallopian tube to be brought within the reach of the actual clip-forceps and to allow it to be taken hold of more satisfactorily. In such known devices the optical system is housed in a special tube alongside the clip-forceps. This is a disadvantage both because the immediate area of operations cannot then be seen even though the optical system looks out on it at along a 160° line of sight, and also because it increases the diameter of the device.

It is an object of the invention firstly to keep the diameter of the forceps instrument and its optical system as small as possible, and secondly to arrange the optical system in such a way that the area between the jaws which is the area of operations can be observed directly.

The invention accordingly consists in a

forceps instrument for fitting tantalum clips to seal off a Fallopian tube in the human female, comprising a barrel having at its distal end forceps jaws for holding a tantalum clip, an operating handle at the proximal end of the barrel, for moving the barrel axially with respect to the jaws to close and open the jaws, and an optical system for observing the fitting of a tantalum clip on a Fallopian tube during the closing of the jaws, including a viewing tube passing centrally through the barrel and terminating at the distal end of the barrel between the forceps jaws.

This construction gives a shape of smaller cross-section in comparison with known clip-forceps, which is important from the patient's point of view, and allows the area of operations to be observed directly.

In order that the invention may be more clearly understood, reference will now be made to the accompanying drawings which show one embodiment thereof by way of example, and in which:—

Fig. 1 shows a side-view of a clip-forceps instrument according to the invention,

Fig. 2 shows an interrupted longitudinal cross-section through the instrument of Fig. 1,

Fig. 3 shows an enlarged cross-section along line A-B of Fig. 2, and

Fig. 4 shows an enlarged cross-section along line C-D of Fig. 2.

Referring now to the drawings, the clip-forceps instrument shown consists of a tubular barrel 1, a guide sleeve 2 for the barrel, a pair of forceps jaws 3, 4, an operating handle in the form of a scissors-grip 5 and an internal viewing tube comprising tubular members 6 and 7 which are rigidly secured together adjacent the distal end of the barrel as by soldering for example. At the proximal end of the barrel a collar 9 on a turned part 8 having a tapered recess (not shown) for receiving an eyepiece 26 of

the optical system projects into the sleeve 2 and between the collar 9 and the tubular member 6 is mounted a spacer bush 10. Grub-screws 11 and 12 clamp parts 2, 6, 8, 9 and 10 together into a unit.

The tubular member 7 has, towards its distal end, two longitudinally orientated grooves 13 in which are mounted the limbs 3a and 4a of the two jaws 3 and 4 of the forceps. A spring locking-ring 14 is firmly engaged in suitable square-cornered annular grooves in the tubular member 7 and in the limbs 3a, 4a of the two jaws. To allow it to be inserted in the annular grooves this ring is a split ring and it is secured rigidly to the tubular member 7 by means of two small rivets located at 15.

The position of the limbs 3a, 4a of the jaws 3, 4 in the barrel 1 enables the jaws to be biased into a normally open position by the action of a spring to be described. To provide a seal within the instrument against gas, e.g. carbon dioxide, escaping from the abdominal cavity, sealing-rings 16, 17 are fitted into appropriate annular grooves in the member 7 and bush 10 respectively.

The scissors-grip 5 consists of a pair of handle parts 18 and 19 which are connected together by a pivot-screw 20. A leaf-spring 21, which is fixed at one end to handle 18 by a knurled screw and which at the other end has a hinged, that is to say articulated, connection to an ear 22 on handle part 19, holds the forceps jaws normally in the open position. Handle part 18 of the grip of the forceps is securely connected to the sleeve 2 by soldering.

As will be apparent from Figure 4 particularly, the inner end of the handle part 19 projects into an axial slot 24 in the sleeve 2, formed for example by milling, and has a square cut-out accommodating a projection 23a of an axially movable fork-shaped pusher member 23, the projection being securely soldered to the handle part 19 in the cut-out. A U-shaped part of the pusher member 23 projects into a slot in the barrel inside the sleeve 2 and engages the sides of the slot 24 which guides the pusher member with respect to the sleeve and limits the axial movement of the pusher member, the slots in the barrel and sleeve permitting the pusher member to slide therein when the handle part 19 is moved. The internal recess in the U-shaped part of the pusher member is such as to receive the tubular member 6. By moving the handle part 19 towards or away from the handle part 18 the barrel 1 is moved axially in the sleeve to move the jaws via the pusher member 23. Because of the engagement of the pusher member in the slot 24 it is impossible for the axially-movable assembly in the forceps instrument (handle

19, pusher member 23 and barrel 1) to turn with respect to the sleeve 2.

There is no necessity for the scissors-grip 5 and the pair of jaws 3, 4 forming the mouth parts of the forceps to lie in the same plane in the way shown in the drawing. It may even be advantageous for the operating handle to lie in a plane which is at an angle of from 30 to 45° with respect to the plane of the mouth of the jaws since when looking through the optical system the operator may use the instrument with the scissors grip held in the uppermost position and can thus manage better if the operating handle is offset.

The proximal end (not shown) of the optical system 25 (which has the eye-piece 26) and a laterally arranged connection 27 which projects at right angles or is directed obliquely backwards and which allows a light-conducting cable to be connected), is tapered for engagement in the tapered recess of the part 8 and is secured to the instrument by means of a union nut 28 and a screw 29. A suitable form of locking is provided so that the light connection 27 will be in the right place, i.e. so that the light-conducting cable leading to the light source will get in the doctor's way as little as possible.

For accurate lining-up, of the parts 2, 6, 8, 9 and 10 during assembly of the instrument, the spacer bush 10 has a circumferential V-groove 30 in which fixing screw 11 engages. This adjustment can also be used to move the pair of jaws 3, 4 described above to the appropriate position relative to the handle 5.

The optical system 25 has a 180° line of sight so that it can see straight into the area of operations, that is to say between the jaws 3, 4. It is set slightly back in the tubular member 7 at the distal end so as not to be damaged.

The method of operation is as follows: a tantalum clip 31 is fitted between the two open jaws 3, 4. The forcep instrument and with it the optical system are then inserted in the abdominal cavity, and the Fallopian tube surrounded under visual observation. The doctor takes hold of handle 19 and moves it towards handle 18 in opposition to spring 21. When this is done the barrel 1 moves in the distal direction in relation to the optical system, slides over the jaws 3, 4 forming the mouth and as it does so closes the pair of jaws and thus the clip 31. The Fallopian tube is sealed off and passage through it blocked. If the doctor now releases his pressure on grip 19, spring 21 will propel it to its original position and at the same time barrel 1 will slide back and the jaws 3, 4 of the forceps will open again as a result of the spring action.

## WHAT WE CLAIM IS:—

1. A forceps instrument for fitting tantalum clips to seal off a Fallopian tube in the human female, comprising a barrel 5 having at its distal end forceps jaws for holding a tantalum clip, an operating handle at the proximal end of the barrel, for moving the barrel axially with respect to the jaws to close and open the jaws, 10 and an optical system for observing the fitting of a tantalum clip on a Fallopian tube during the closing of the jaws, including a viewing tube passing centrally through the barrel and terminating at the distal end of 15 the barrel between the forceps jaws.
2. An instrument as claimed in claim 1, wherein the viewing tube includes two tubular members of which one member having diametrically opposed axial grooves 20 therein is mounted in the distal end of the barrel and is rigidly connected to the distal end of the other tubular member which extends beyond the proximal end of the barrel and wherein the jaws which project 25 from the distal end of the barrel have mounting limbs which engage in said grooves respectively and are immovable axially of the viewing tube.
3. An instrument as claimed in claim 2, 30 wherein the limbs of the forceps jaws are connected to said one tubular member, in

said barrel by a split spring ring to prevent axial movement of said limbs relative to the viewing tube.

4. An instrument as claimed in claim 1, 35 2 or 3, wherein the operating handle comprises a scissors-grip having two handle parts of which one handle part is rigidly connected at the proximal end of the instrument to a guide sleeve surrounding the 40 proximal end of the barrel and rigidly connected to the viewing tube, and the other handle part which is spring-urged away from said one handle part extends into an axial slot in said sleeve and is rigidly connected to the barrel by a fork shaped 45 member receiving the viewing tube, whereby the barrel can be moved axially to close and open the forceps jaws by closing and opening the handle parts. 50

5. An instrument as claimed in any preceding claim, wherein the operating handle lies in a plane which is at an angle of from 30 to 45° with respect to the 55 plane of the mouth of the forceps jaws.

6. A forceps instrument substantially as hereinbefore described with reference to the accompanying drawings.

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